CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A method of forming a field effect transistor (FET) transistor, comprising:
providing a substrate;
forming a layer on the substrate, the layer having a side surface;
forming an epitaxial channel on the side surface, the channel having a first sidewall;
removing the layer for exposing a second sidewall of the channel;
forming source and drain regions coupled to ends of the first channel; and
forming a gate adjacent to at least one of the sidewalls of the channel.

2. A field effect transistor (FET) comprising:
a substrate;
a source region and a drain region in the substrate, each of said source region and said drain region having a top, bottom and at least two side diffusion surfaces, the source and drain regions separated by an epitaxially grown channel region having a top, bottom and side channel surfaces substantially coplanar with corresponding ones of the diffusion surfaces;
a gate adjacent the top and the side channel surfaces and electrically insulated from the top and side channel surfaces; and
the gate comprising a planar top surface, the planar top surface having a contact for receiving a gate control voltage for controlling the FET.

3. The FET as recited in claim 2, wherein the source and drain have a contact for receiving a control voltage for controlling the FET.

4. The FET as recited in claim 2, wherein the gate is substantially centered between and substantially parallel to said source region and said drain region.

5. The FET as recited in claim 2, further comprising a silicide layer that contacts a top surface of said gate.

6. The FET as recited in claim 2, further comprising a dielectric layer that contacts a first side end and a second side end of said gate.

7. The FET as recited in claim 2, further comprising a dielectric that contacts side surfaces of the channels.

8. The FET as recited in claims 2, where the gate is comprised of polysilicon.

9. The FET as recited in claim 2, wherein the channel is approximately one fourth of a length of the FET.

10. The FET as recited in claim 2, further comprising a dielectric material in the gate for electrically separating the gate into two electrically isolated portions, each having a substantially coplanar top surface and a contact pad on each respective substantially coplanar top surface.

11. The FET as recited in claim 2, wherein said epitaxial channel is formed of a combination of Group IV elements.

12. The FET as recited in claim 2, wherein said epitaxial channel is formed of an alloy of silicon and a Group IV element.

13. The FET as recited in claim 2, wherein said epitaxial channel is formed of an alloy of silicon and at least one of germanium and carbon.

14. A method for forming a double gated field effect transistor (FET), comprising the steps of:

forming on a substrate a first and a second epitaxially grown channels;

etching areas within a silicon layer to form a source and a drain, wherein a side surface of the source and the drain contact opposing end surfaces of the first and second epitaxially grown channels; and

forming a gate that contacts a top surface and two side surfaces of the first and second epitaxially grown channels and a top surface of the substrate.

15. The method as recited in claim 14, wherein the forming step comprises the steps of:

forming first and second silicon lines, each end of the silicon lines contact an end of the source and the drain;

forming an etch stop layer on an exposed side surface of each of the first and second silicon lines;

epitaxially growing first and second silicon layers on each etch stop layer;

etching away the first and second silicon lines and etch stop layers;

filling areas surrounding the first and second epitaxially grown silicon layers and between the source and the drain with an oxide fill;

etching a portion of the oxide fill to form an area that defines a gate, wherein the area that defines the gate is substantially centered between and substantially parallel to the source and the drain; and

depositing a material to form a gate.

16. The method as recited in claim 15, further comprising the steps of:

etching the oxide fill between the gate the source to expose the first and second epitaxially grown silicon layers; and

etching the oxide fill between the gate and the drain to expose the first and second epitaxially grown silicon layers.

17. The method as recited in claim 16, further comprising the step of forming an oxide on the first and second epitaxially grown silicon layers.

18. The method as recited in claim 17, wherein the oxide is silicon dioxide.

19. The method as recited in claim 16, further comprising the steps of:

implanting a portion of the epitaxially grown silicon layers between the gate and the source; and

implanting a portion of the epitaxially grown silicon layers between the gate and the drain.

20. The method as recited in claim 18, wherein the implanting step is in the range of 10 to 45 degrees relative to a vector perpendicular to a top surface of the epitaxially grown silicon layers.

21. The method as recited in step 14, wherein the implants are done in a series at approximately 90 degrees relative to each other.

22. The method as recited in claim 14, further comprising the step of forming a contact on each of the gate, the source and the drain.

23. The method as recited in claim 14, wherein the gate material is polysilicon.